

A TECHNIQUE FOR REARING AND SOME NOTES ON THE
BIOLOGY OF A DESERT SAND COCKROACH, *ARENIVAGA*
INVESTIGATA (DICTYOPTERA: POLYPHAGIDAE)

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Abstract.—A simple technique for rearing a desert sand cockroach, *Arenivaga investigata* Friauf and Edney, is presented, and observations on its age-dependent egg production are included.

A desert sand cockroach, *Arenivaga investigata* Friauf and Edney, is an important species in laboratory studies of physiological ecology. Some of its unique features, such as absorption of water from unsaturated air (Edney, 1966; O'Donnell, 1977) and low rate of water loss (Edney, 1968), have contributed to our knowledge of adaptations to xeric environments. Cochran (1979) reported a culturing method for *A. tonkowa* Hebard; however, to date, there have been no reports of successful rearing of *A. investigata*. We report herein a technique for rearing *A. investigata* that has proved successful in our laboratory and measurements of female age-dependent egg production.

MATERIALS AND METHODS

Adult females and nymphs of *A. investigata* were collected at the type locality of "Windy Point," 9.7 km west of Palm Springs in Riverside County, California, in March, 1981. The specimens were found in sand dunes at a depth of 0.25-0.5 m. The small collection consisted of two adult females and five nymphs.

Our culture technique is similar to the method developed by Cochran (1979) but slightly modified from observations of the collection site. Most of the cockroaches were found in fairly fine, moist sand (20-30% moisture), but they could easily burrow upward into essentially dry areas. A 1-gallon glass jar filled with fine chromatographic grade sand (200-mesh) to a depth of 7 cm served as the culture container. Water was provided by burying a tightly covered 70-ml glass jar with a 5-mm-diam central hole in the cover which secured a piece of dental wick ca. 1 cm above the cover. Five or six pieces of dry dog chow, crushed or in pellet form, were placed on the surface of the sand. Each month 15 ml of water were added to the sand. The culture container, covered with paper toweling and secured with a rubber band, was kept on a laboratory bench subject to ambient temperature (23-27°C), RH (30-40%) and light fluctuations.

RESULTS

After their placement on the surface of the sand, the cockroaches rapidly burrowed until they were completely covered. The cockroaches remained submerged

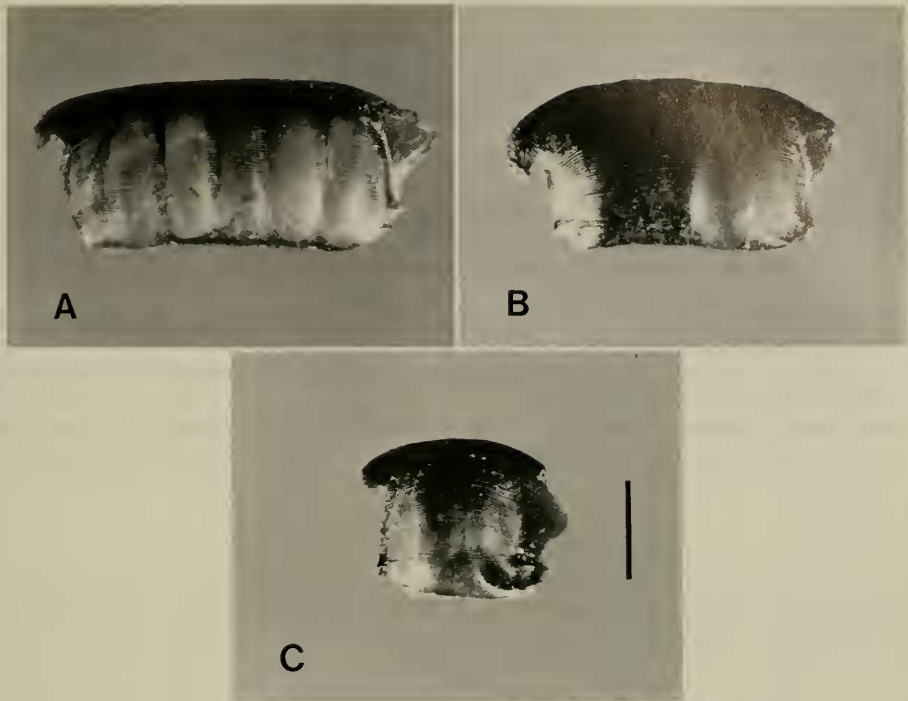


Fig. 1. *Arenivaga investigata* oothecae. A, From young (1–3 month) adult females. B, From middle-aged (3–6 month) adult females. C, From old (>6 month) adult females. Scale represents 2 mm.

in the sand throughout the photophase; however, adult males and females and, on rare occasions, nymphs were observed on the surface during the scotophase. Unlike *A. tonkowa* (Cochran, 1979), *A. investigata* were never observed atop the sand during the photophase, despite some disturbances.

Two months following the initiation of the colony, an adult male was observed, and about one week later the first ootheca was found. During the next year over 20 oothecae, averaging 7.7 eggs/ootheca, were deposited of which only two hatched, yielding 16 nymphs (8♂ and 8♀) that successfully developed and reproduced. Interestingly, adult males survive less than two months following adult ecdysis. As the age of adult females increases the number of eggs deposited/ootheca decreases. A young female deposits 8–11 eggs/ootheca (8.0–9.5 × 3.5 mm) whereas females near death deposit 1–4 eggs/ootheca (3.5–6.5 × 3.5 mm). Fig. 1 shows typical oothecae from young, middle-aged, and old females.

DISCUSSION

The technique described has provided a successful albeit small laboratory culture of *A. investigata*. Although no quantitative life cycle studies have yet been undertaken, development from egg to adult takes about seven months.

Decreasing numbers of eggs per successive ootheca have been observed in *Blattella germanica* (L.) and *B. vaga* Hebard (Willis et al., 1958); however, to our knowledge, this is the first report of this phenomenon in a polyphagid species.

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LITERATURE CITED

- Cochran, D. G. 1979. A method for rearing the sand cockroach, *Arenivaga tonkowa* (Dictyoptera: Polyphagidae). Proc. Entomol. Soc. Wash. 81: 580-582.
- Edney, E. B. 1966. Absorption of water vapor from unsaturated air by *Arenivaga* sp. (Polyphagidae, Dictyoptera). Comp. Biochem. Physiol. 19: 387-408.
- . 1968. The effect of water loss on the haemolymph of *Arenivaga* sp. and *Periplaneta americana*. Comp. Biochem. Physiol. 25: 149-158.
- O'Donnell, M. J. 1977. Site of water vapor absorption in the desert cockroach *Arenivaga investigata*. Proc. Natl. Acad. Sci. USA 74: 1757-1760.
- Willis, E. R., G. R. Riser, and L. M. Roth. 1958. Observations on reproduction and development of cockroaches. Ann. Entomol. Soc. Am. 51: 53-69.